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Theater Ballistic Missile  
Defense: Strengthening the Glue  
That Holds the Puzzle Together

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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## ABSTRACT

The proliferation of theater Ballistic missiles (TBMs) and their use as weapons of terror as demonstrated during the Gulf War clearly demonstrate the need to be able to defend against this type of weapon. The United States military must address this need and demonstrate it's resolve to adequately defend not only it's own forces but friendly forces, cities and populace as well. The potential use of warheads which are nuclear, chemical, or biological further complicate this issue.

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## INTRODUCTION

By some accounts the U.S. led coalition that successfully defeated Saddam Hussein's army came dangerously close to disintegration. Had Saddam been able to entice the Israelis into entering the conflict, the Arab members of the coalition would have had to make a difficult choice. Either they remained focused on the objective of defeating an Arab aggressor or they refused to fight alongside the Israelis.

Saddam had chosen a strategy of attacking Israel with theater ballistic missiles (TBMs) to force them into an act of retaliation. This was essentially a direct attack on one of the coalition's strategic centers of gravity. If it had been successful in drawing Israel into the conflict, it may very well have fractured the coalition. He had properly identified that, though vulnerability to ballistic missile attack may not have been militarily critical, politically, this weakness was a major issue. Despite having assembled an overwhelming military force, the coalition lacked adequate TBM defense.

Through extraordinary diplomatic effort and the rapid deployment of Patriot Missile Defense Systems, the U.S. was able to forestall Israeli offensive action. Nonetheless, the minor destruction and terror Saddam was able to inflict brought to the forefront the very real need to strengthen the U.S. ability to counter the TBM threat.

Responding to the theater ballistic missile defense (TBMD) challenge, the latest version of Doctrine for Joint Theater

Missile Defense was published in February 1996. The doctrine offers four elements for conducting TBMD:

- Active Defense
- Passive Defense
- Attack Operations
- Command, Control, Computers, Communication and Intelligence (C4I)

This paper will address the problem of TBMD from the perspective of the theater commander today. Following a brief background into the evolution of the TBM threat it will assess current and near term developments in active defense, passive defense, and attack operations. Finally, it will focus on C4I as a key area on which the theater commander must focus. Within C4I there are several issues which if properly addressed will transform this potential vulnerability of TBMD into a clearly demonstrated strength. The first is the necessity for proper intelligence preparation of the battlefield (IPB). The second is whether to use centralized or decentralized control in executing TBMD. Finally, the issue of who should be controlling TBMD assets to optimize all aspects of TBMD in a coherent and coordinated manner is addressed.

The TBMD objective is to negate enemy TBM effectiveness. To be effective, it must, at a minimum, significantly decrease the utility of these weapons to a potential enemy so that he is inclined to remove them from his arsenal.

## BACKGROUND

The Iraqi use of TBMs in the 1991 Gulf War was not the first such use of this type of terror weapon. In 1944, a German program known as Aggregate 4, or the V-2, was developed and implemented. During a seven month period the Germans fired around 4,300 of these ballistic missiles, averaging 20 per day directed mainly at Antwerp and Liege in Belgium and at London and south east England. Nearly 2,500 deaths and 6,500 injuries were attributed to these attacks.<sup>1</sup>

Following the defeat of Germany, teams of scientists and engineers employed on the development and production of the V-2 missile were captured by the Russians and Americans. Russia captured both a development site and a production factory as well. The United States took 100 missiles back to the White Sands Missile Test Range. Proliferation had started.<sup>2</sup>

In the ensuing decades the development and enhancement of missile delivered terror continued. They were next employed by Egypt against Israel in 1973 during the Arab/Israel War. Leading up to the Gulf War, Iraq employed over 600 TBMs against Iran between 1986 and 1988. Afghanistan fired at least 200 TBMs against the Mojahedin between 1988 and 1991. Even Libya fired two TBMs against Sicily in 1986.<sup>3</sup>

By March, 1995 there were approximately 12,000 TBMs in the arsenals of 32 countries around the world.<sup>4</sup> These weapons are relatively simple and easy to obtain. Third world operators can be trained to employ them. Availability, affordability, and

employability from mobile launchers make TBMs attractive terror weapons for emerging countries attempting to assert themselves in the world's larger military and more sophisticated diplomatic circles.

The type of warhead which can be placed on ballistic missiles is a source of major concern as well. Relatively few countries have the ability to produce nuclear, chemical and biological weapons, commonly grouped together and known as weapons of mass destruction (WMD), but these weapons have great attraction for countries given to terror tactics. More importantly, as demonstrated by the Iraqi leadership during the Iran-Iraq War, there seems to be little moral dissuasion against using these weapons. This trend does not bode well for potential victim countries because of the enormous complications defense against WMDs introduce.

The United States clearly recognizes the threat TBMs represent. Following the creation of the Ballistic Missile Defense Organization (BMDO) from the Reagan era Strategic Defense Initiative Organization (SDIO) in 1992, significant resources have been allocated to ballistic missile defense. Further, BMDO resources for future TBMD programs in fiscal years (FYs) 1997 to 2001, are expected to be on the order of \$10 billion.<sup>5</sup>

What can we do to counter this threat? As stated earlier, this problem will be addressed by first assessing the current situation with respect to active defense, passive defense, and attack operations.

## **TBMD ELEMENTS**

### **ACTIVE DEFENSE**

Active defense involves the destruction or neutralization of TBMs in flight.<sup>6</sup> To better bound the task, active defensive systems have been divided into area and theater. Area systems defend within the atmosphere. Theater systems defend in space, above the atmosphere. Together, the systems described comprise the "core" TBMD systems.

Area systems currently in development include the Army's Patriot Advanced Capability (PAC)-3 system and the Navy's Aegis Weapons System. The PAC-3 is the follow-on to the PAC-2 which was deployed to Saudi Arabia and Israel during the Gulf War. The PAC-3 system will improve the current system through a series of upgrades to the radar as well as a new interceptor. PAC-3 will increase detection range, provide better target identification, improve the engagement of targets with reduced radar signatures, increase target handling capability, increase firepower, and enhance survivability.<sup>7</sup> PAC-3 should be deployable in the latter part of FY 1998.

The other area system currently in development involves is the Navy's Aegis Weapon System. Originally that system was not optimized to counter the TBM threat. To achieve full TBMD capability, the Navy is modifying the Aegis Combat System's computer programs, Command and Decision System, display system, SPY-1 Radar System and developing Navy Standard Missile (SM)-2 Block IVA which will be capable of engaging TBMs within the

atmosphere.<sup>8</sup> The first fleet units are scheduled to receive operational SM-2 Block IVA interceptors and TBMD tactical programs in FY 2000.

The Army's Theater High Altitude Area Defense (THAAD) system is the final core system and is the theater defense component of the TBMD systems. This system will provide broad surveillance and a large intercept envelope to defeat TBM threats directed against wide areas, dispersed assets and strategic targets such as population centers and industrial facilities. THAAD will engage in space to minimize damage caused by debris and chemical/nuclear munitions. THAAD consists of two separate but closely related programs: the THAAD Weapons System and the Theater Missile Defense Ground Based Radar (TMD-GBR) surveillance and fire control radar system.<sup>9</sup> While area systems will, in almost all instances, allow for only one engagement, because of the high altitude, longer range intercept capability of THAAD, initial intercept will be followed by a kill assessment. If kill assessment warrants reengagement it would be possible by either firing another THAAD weapon or passing the target to an area weapon system for engagement.<sup>10</sup> THAAD is expected to be operational in FY 2002.

Theater wide employment of the these diverse systems poses a considerable command and control challenge for the theater commander. System inter-operability is the key to the solution. Though the systems are being designed to be fully inter-operable the mere fact that separate services are developing them could

pose a problem. Inter-operability demonstration tests and exercises are designed for success and invariably lead to the conclusion that the systems can and will work well together. Still, when the systems are transported to a distant location and tested under fire the results may be different. The services must strive for inter-operability and the theater commander must be knowledgeable enough of this issue to provide the necessary operational work-arounds prior to the first shot being fired.

#### **PASSIVE DEFENSE**

The second element the theater commander must concern himself with involves passive defense. "Passive defense is necessary to provide essential individual and collective protection for friendly forces, population centers and critical assets."<sup>11</sup> To accomplish this important aspect of TMD, the theater commander must ensure that two distinct groups, military personnel and civilians, are properly prepared for attack. The first step is early and active involvement with the host nation government in the education of the civilian populace. The threat may be conventional, nuclear, biological or chemical. It may be targeted at population centers, industrial facilities, historical or ethnically significant sites. Warning prior to attack may be extremely short. The key to maximizing passive defense for the civilian population is ensuring information concerning the threat and how to react is disseminated to the maximum extent possible.

Coupled with education is properly provisioning civilians for

attack. This includes distribution of protective equipment and construction of bunkers and other safe areas. "Having lived under the threat of imminent attack for many years, the Israeli government has done a credible job in preparing for attack."<sup>12</sup> The challenge the theater commander must meet is to duplicate an effort similar to the Israelis and make target areas as safe as possible prior to attack. This will require a full time team working closely with host nation governments for success.

The second step is ensuring friendly military forces are fully prepared for passive defense against TBM attack. This can be done through a combination of operations security, deception, mobility, hardening, redundancy, or dispersal.<sup>13</sup> Success in this area of passive defense is more easily achieved owing to the inherently disciplined nature of the armed forces and the training and preparation generally received prior to arrival at the scene of a potential conflict.

#### **ATTACK OPERATIONS**

The third element for the theater commander to address is attack operations. "Attack operations are characterized by offensive actions intended to destroy and disrupt enemy theater missile capabilities before, during and after launch."<sup>14</sup> Ideally, if the theater commander could pinpoint the exact location of all launchers the problem would be relegated to target assignment and attack. Unfortunately, TBM launcher mobility frustrates this method to defeat them. More often than

not the theater commander will know the exact location of, at best, only a few launchers and "location by launch" may prove not timely enough for launcher destruction.

Air superiority alone will not provide the means to eradicate the threat. During Desert Storm, the U.S. led coalition enjoyed satellite intelligence and virtually complete air supremacy over all of Iraq. Nonetheless, though the rate of Iraqi Scud launches declined during the war, the Iraqis still managed to launch 16 missiles in the conflict's last week, with some reports indicating that Iraq still possessed scores of launchers and was preparing for a massive Scud attack against Israel at the very end of the war.<sup>15</sup>

For the theater commander the problem associated with attack operations will not disappear as long as the enemy has the ability to move his launchers. Given the range of TBMs and the associated depth that attack operation assets must penetrate to destroy launchers and their supporting infrastructure; the theater commander must insist on rapid response, multiple means of engagement and timely, accurate threat information to have any chance of neutralizing or destroying enemy TBMs prior to launch.

## PUTTING THE PIECES TOGETHER

Unlike the previous elements, C4I, the final element, is more abstract. Active defense, passive defense, and attack operations provide the tools and materials necessary to execute TBMD while C4I offers the blueprint and establishes the command and decision process necessary for execution. C4I cannot be distilled into a finite and clearly defined list of absolutes. However, properly executed command and control can tie the previously discussed elements together into a cohesive defense provided a necessary level of inter-operability can be maintained. Command and control is the glue holding the TBMD puzzle together and the theater commander must make this glue as strong as possible.

With respect to TBMD, the theater commander must concentrate the majority of his effort in C4I if he is to be successful in defeating enemy theater ballistic missiles. No commander can accurately predict the circumstances he will face in future operations against TBMs. He may have anywhere from hours to months of warning prior to entering into actual conflict. Regardless, he should have etched firmly in his mind how he plans to organize his staff and subordinate commands to address the TBM threat. Central to developing C4I for future operations against TBMs is who is controlling the TBMD assets, how are they being controlled and what information is needed going into the conflict to adequately prepare.

Initially the theater commander must address the issue of proper intelligence preparation of the battlefield (IPB). He

must have in place the ability to properly assess the threat and determine what course of action is necessary to defeat that threat. The intelligence and information exchange network must be timely enough to allow for proper analysis of the battle area and to predict possible enemy missile launch areas.

Reconnaissance, signal intelligence, special forces and airborne sensors will search for clues that enemy missile activity is imminent.<sup>16</sup> There are several systems available for his use in accomplishing this task including: Joint Tactical Information Distribution System (JTIDS), Joint Tactical Ground Station (JTGS) and Joint Surveillance target Attack Radar System (J-STARS).

The second issue the theater commander must decide upon is how he will control the execution of TBMD within his area of operations. There are arguments for both centralized and decentralized control. On the one hand, centralized control, especially during the execution of active defense, may be required in order to husband vital ammunition. In addition, centralized control may enhance the probability of engaging an incoming ballistic missile with multiple active defense assets while simultaneously preventing the accidental attack (blue-on-blue) on own assets.

On the other hand, when executing attack operations, centralized control is more time consuming and thus, may not be responsive enough to meet reaction time demands. "During Desert Storm the centralized control exercised over attack operations

was largely unsuccessful because it was too slow."<sup>17</sup>

The ideal situation might be, during TBMD execution, to centralize control for active defense and decentralize control for attack operations. In theory this may look good on paper. However, the confusion created or the potential for confusion in adopting two diametrically opposed methods of control is counter to the necessity to simplify the TBMD problem to the maximum extent possible. Guidance from the operational level must eliminate confusion for subordinates at the tactical level which could ultimately lead to missed engagements or wasted opportunities.

A proposed solution combines the two methods by exercising centralized control with command by negation similar to Navy battle group anti-air warfare (AAW) operations. Within the battle group the commander delegates defensive AAW to the AAW commander who then, in turn, assigns target engagement according to subordinate system's capabilities to develop threat tracks. In this manner active defense systems would be free to engage targets unless the action was negated by higher authority, perhaps from the theater commander's staff. Similarly, attack operations could be executed immediately upon receipt of threat information without the necessity for an order from the theater commander.

Available communications and data transmission capabilities (including JTIDS, JTACS and J-STARS) give the theater commander the ability to monitor the threat picture development. He could

then oversee the execution without having to intervene at the tactical level unless deemed absolutely necessary. This method would minimize sensor-to-shooter times for attack operations while ensuring active defense did not waste valuable assets by simultaneously engaging single targets with multiple interceptors. This would alleviate the current situation where all assets act more or less independently.

Joint Pub 3-05.1, Joint Doctrine for Theater Missile Defense, does not define a recommended command structure for today's theater commander with respect to TMD. It does address the responsibilities of some key individuals within the TBMD defense organization. Specifically, it states that the Joint Force Commander (JFC) will normally assign overall responsibility for air defense to an Area Air Defense Commander (AADC).<sup>18</sup> It also states that the JFC will normally assign responsibility for the planning and execution of joint theater missile defense (JTMD) attack operations outside the component commanders areas of operations to the Joint Forces Air Component Commander (JFACC).<sup>19</sup> Further amplification states that in some instances the responsibilities of the AADC may be assigned to the JFACC.<sup>20</sup>

Intermeshed with the AADC, JFACC and their staffs are the component commanders and their staffs who are responsible for the planning and execution of combat operations in support of both attack operations and active defense. All of these layers leave some doubt as to who is prioritizing the efforts in the execution of the overall theater defense. The systems that will integrate

the battlefield and provide a seamless defense will not be used to maximum effect if the effort cannot be properly controlled and coordinated.

It is folly to think that the AADC and/or JFACC will be able to, with 100% accuracy, deconflict the competing requirements during a hot war situation when the threat involves TBMs, cruise missiles and manned aircraft. The time criticality of both attack operations and imminent attack warnings necessitate that a single designated entity focus solely on the ballistic missile threat. This entity could be a cell within the AADC or JFACC staffs or resident with one of the component commanders. Where the TBMD cell resides is secondary to the fact that it must exist.

The overall effect of having this cell will be to provide for rapid assessment of intelligence and better defined and more refined information to the component commanders tasked with both attack operations and active defense. This will be doubly important when the full complement of systems currently in development become available and are integrated. Additionally, a portion of the cell should be devoted to ensuring passive defensive measures for both civilians and military personnel are executed properly.

## SUMMARY

Presenting a coherent TBM defense is a challenge for today's theater commander. To do this he will have to ensure he is properly prepared to execute passive defense, active defense, attack operations, and C4I. The active defense systems necessary to defeat the TBM threat are or will soon be deployable. These will provide theater commanders with theater and area defense in depth which allows rapid reaction against TBMs in all theaters. Passive defenses are and will continue to be a concern of the theater commander. Regardless of actions he takes in preparation for TBM attack, the real measure of effectiveness will be if, after the attack, it's effects were successfully nullified.

Attack operations will continue to challenge the theater commander as long as the enemy has mobile launchers. Better cuing, intelligence and minimizing sensor-to-shooter times will enhance future attack operations.

Of the four elements, the one that holds the others together and makes a TBMD possible is C4I. The systems and communications capabilities necessary to link all levels of command together are available now with enhancements due in the near future.

How he will organize his command for TBMD will be crucial to his success. He must ensure provisions are made and responsibilities assigned for which TBMD is the primary thrust. Further, proper intelligence preparation of the battlefield must include focused intelligence data to evaluate the TBMD threat. This will facilitate planning for elimination of any TBM threat.

Given the advances in technology of both ballistic missiles and the defense against those missiles, attempting to say definitively how the problem of TBMD will be solved once and for all is like attempting to hit an erratic target. By continuing to concentrate in the C4I area and making continuous improvements to how the command function is structured, the theater commander will be able to offer a responsive and effective defense against current and future ballistic missile threats.

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